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RESEARCH ARTICLE

Risk factors, complications, maternal and neonatal outcomes among post-Covid mothers in a tertiary care hospital, Puducherry, India - A case control study

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ABSTRACT

Objectives: There is very less literature about the impact of COVID-19 infection in the past on current reproductive and maternal health. Therefore, this study aims to compare the incidence of risk factors, complications and maternal and fetal outcomes in women with post covid (cases) and women without covid (controls). **Methods:** This was a hospital based case control study conducted during 2021-2022 in the department of Obstetrics & Gynaecology of a tertiary care hospital in Puducherry, India. Women delivered with a history of COVID-19 infection before or during pregnancy were enrolled for the study as cases. Controls were taken before the covid period. The data were collected from the labour ward delivery register, operating room records, patient case notes obtained from the main records department and discharge notes from hospital HMIS. **Results:** A total of 50 cases and 100 controls were included in the analysis. Around 64% of the post Covid mothers had obstetric risk factors compared to 41% of controls (OR=2.54, p=0.008). Similarly, significantly high pregnancy complication was present in post-Covid mothers as compared to normal mothers (58% vs 3%, OR=43.07, p<0.001). The most common risk factors among post-Covid mothers were hypothyroidism (30%) and anaemia (20%). The most common complications were Oligohydramnios (16%), GDM (14%) and PPH (10%). About 8% of the post-Covid mothers had a blood transfusion and 24% of babies received NICU care. **Conclusion:** Obstetric risk factors and complications were significantly high among post-Covid women. Interventions to reduce the risk factors and complications among these women are much needed.

Keywords: COVID-19, maternal risk-factors, complications.

COVID-19 caused by severe acute respiratory syndrome corona virus - 2 is a global public health emergency as declared by World Health Organization [1]. Since the declaration of COVID - 19 disease as a pandemic on March 11, 2020, till march 2022 there are 46,48,09377 confirmed cases. Currently, there is no evidence that pregnant women are more susceptible to COVID-19 infection. However severe complications occur during the third trimester, like pneumonia, admission to ICU, and the need for mechanical ventilation with a high fatality rate when affected with COVID – 19 [2].

Maternal complications like preterm births and increased caesarean section rates are well studied in COVID - 19 complicating pregnancy [3]. The frequency of miscarriage or congenital anomalies seems to be similar to national population based data. Neonatal complications like prematurity, respiratory distress syndrome and a higher rate of neonatal hospitalization were recorded. Many women of reproductive age who were affected with COVID - 19 in the past, enter into motherhood at the end of the third wave of the pandemic [4].

Although, COVID - 19 is considered an acute illness no data is available regarding its effects on the reproductive health of women. It is a well - known fact that COVID - 19

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is associated with a decline in male fertility [5]. The novel coronavirus invades the target cells by binding to ACE2 receptors which are widely expressed in ovaries, uterus, vagina and placenta. In addition to controlling luteal angiogenesis and degeneration, Ang II, ACE2, and Ang - (1-7) also affect the regular changes in endometrial tissue and embryo development [6]. However, the magnitude of affection of SARS COV2 in these organs is less studied. There are many studies which analyzed the maternal and perinatal outcomes of COVID – 19 affected pregnancies [7-10]. However, there is very less literature about the impact of COVID-19 infection in the past on current reproductive and maternal health. Therefore, this study aims to compare the incidence of risk factors and complications in women with post covid (cases) and women without covid (controls) and also to analyze the obstetric and fetal outcomes of women affected by COVID -19 in the past.

Methods

This was a hospital based case control study conducted during 2018-2022 in the department of Obstetrics & Gynaecology of a tertiary care hospital in Puducherry, India. Women delivering with a history of COVID -19 infection before or during pregnancy, were enrolled for the study as cases. Controls were taken before the covid period. Considering the percentage of controls have risk factors as 35% [11] with an odds ratio of 2.7, 95% confidence interval and 80% power, the calculated sample size for the study was 150 (50 cases and 100 controls).

The data were collected from the labour ward delivery register, operating room records, and patient case notes obtained from the main records department and discharge notes from hospital HMIS. Information extracted from the records included demographics, parity, gestational age, clinical presentation, risk factors for placental abruption, complications, and perinatal and maternal outcomes. Required data of age, parity and gestational age matched women without covid from 2018 -2019 was also retrieved from the records. A pre-designed and pre-tested semistructured questionnaire was used to collect data from the records.

Study variables: Demographic details and clinical variables like age, area of residence, socioeconomic status, occupation, BMI, parity, and gestational age at delivery were taken.

Outcome variables: Presence of risk factors, complications, type of delivery, maternal and neonatal outcomes were noted.

The study protocol was reviewed and approved by the institute ethics committee of a tertiary care teaching institute in Puducherry, India. The patient identities were removed while retrieving data from records. The anonymity of the data was maintained throughout the study.

Statistical analysis: Data were entered into MS Excel, coded, and analyzed in statistical software STATA, version 14. Demographic and clinical parameters were summarized as frequency and percentages. The significance of the difference in proportions in the two groups was assessed by Pearson's Chi-square test or Fisher's exact test (for small frequencies). Risk analyses were performed to quantify associations in terms of odds ratios (OR) along with 95% confidence interval (CI). The difference in gestational age, Apgar score and birth weight of the baby were analyzed between the two groups using an independent sample t - test. A p - value <0.05 will be considered statistically significant.

Results

A total of 50 cases and 100 controls were included in the analysis. The comparison of sociodemographic characteristics of the post-Covid mothers with normal mothers is depicted in table 1.

Table 1: Comparison of sociodemographic characteristics of the post-Covid mothers with normal mothers

Sociodemographic characteristics	Cases (N=50) n (%)	Controls (N=100) n (%)	P value
Age in years			
<25	14 (28.0)	32 (32.0)	0.916
25-29	25 (50.0)	44 (44.0)	
30-34	8 (16.0)	18 (18.0)	
>34	3 (6.0)	6 (6.0)	
Area of residence			
Rural	32 (74.0)	70 (70.0)	0.463
Urban	18 (36.0)	30 (30.0)	
Occupation			
HW	32 (64.0)	54 (54.0)	0.466
IT	16 (32.0)	39 (39.0)	
Teacher	2 (4.0)	7 (7.00	
Socioeconomic class			
APL	28 (56.0)	59 (59.0)	0.726
BPL	22 (44.0)	41 (41.0)	
Parity			
Primi	24 (48.0)	46 (46.0)	0.817
Multi	26 (52.0)	54 (54.0)	
BMI			
Normal	38 (76.0)	82 (82.0)	0.386
Overweight/obese	12 (24.0)	18 (18.0)	
Gender of the baby			
Female	19 (38.0)	50 (50.0)	0.164
Male	31 (62.0)	50 (50.0)	

Half (50%) of the participants in cases and 44% in controls belonged to the age group 25-29 years. About 6% of the mothers aged more than 35 years in both groups. About 74% of cases and 70% of controls were from rural areas. Most of the mothers in both groups were homemakers (64% vs 54%) and were below the poverty line (56% vs 59%).

Nearly half in both groups were multiparous and one-fourth was overweight or obese. There was no significant difference in the gender of the baby between the groups.

Table 2: Comparison of risk factors, maternal and neonatal outcomes among post-Covid mothers with normal mothers

Parameters	Cases (N=50) n (%)	Controls (N=100) n (%)	OR (95% CI)	P value
Presence of risk factors				
Yes	32 (64.0)	41 (41.0)	2.54 (1.26-5.21)	0.008
No	18 (36.0)	59 (59.0)	Ref	
Presence of complications				
Yes	29 (58.0)	3 (3.0)	43.07 (13.09-192.60)	<0.001
No	21 (42.0)	97 (97.0)	Ref	
Term				
Pre-term	6 (12.0)	1 (1.0)	13.27 (1.89-315.40)	0.003
Term	44 (88.0)	99 (99.0)	Ref	
Induction of labour				
Yes	23 (46.0)	34 (34.0)	1.65 (0.82-3.32)	0.153
No	27 (54.0)	66 (66.0)	Ref	
Mode of delivery				
LSCS	33 (66.0)	26 (26.0)	6.43 (3.01-14.24)	<0.001
Instrumental	3 (6.0)	2 (2.0)	7.46 (1.02-67.57)	
SVD	14 (20.0)	72 (72.0)	Ref	
Blood transfusion				
Yes	4 (8.0)	1 (1.0)	8.48 (1.03-214.9)	0.024
No	46 (92.0)	99 (99.0)	Ref	
Resuscitation				
Required	12 (24.0)	6 (6.0)	4.89 (1.72-15.05)	0.001
Not required	38 (76.0)	94 (94.0)	Ref	
NICU admission				
Yes	12 (24.0)	6 (6.0)	4.89 (1.72-15.05)	0.001
No	38 (76.0)	94 (94.0)	Ref	

Table 3. Comparison of gestational age, Apgar score and weight of the baby among post - Covid mothers with normal mothers

Parameters	Cases (N=50)	Controls (N=100)	P value
Gestational age, mean (SD)	37.9 (1.9)	38.6 (1.2)	0.008
Apgar 1, median (IQR)	8 (7-9)	8 (8-8)	0.001
Apgar 2, median (IQR)	9 (9-9)	9 (9-9)	0.072
Weight of the baby, mean (SD)	2.8 (0.5)	2.9 (0.4)	0.164

The comparison of obstetric risk factors, maternal outcomes and neonatal outcomes among post-Covid mothers with normal mothers is shown in table 2. Around 64% of the post-Covid mothers had obstetric risk factors compared to 41% of controls (OR=2.54, p=0.008). Similarly, significantly high pregnancy complication was present in post-Covid mothers as compared to normal mothers (58% vs 3%, OR=43.07, p<0.001). Around 12% of the post-Covid mothers had preterm delivery and only 1% of the normal mothers had preterm delivery (OR=13.27, p=0.003). The induction of labour was significantly different between the groups. LSCS was significantly high among post-Covid mothers as compared to normal mothers (66% vs 26%, P<0.001). About 8% of the post-Covid mothers had a blood transfusion and 24% of babies received NICU care. There was a significant difference in gestational age and Apgar score measured during the delivery between the post-Covid mothers and normal mothers (p=0.001). However, the mean weight of the baby was not significantly different between the groups (table 3).

Table 4: Types of risk factors and complications developed among post-Covid mothers with normal mothers

Factors	Cases (N=50) n (%)	Controls (N=100) n (%)	Total n (%)
Risk factors			
Anaemia	10 (20)	28 (28)	38 (25.3)
Hypothyroidism	15 (30)	13 (13)	28 (18.7)
Bronchial asthma	3 (6)	0	3 (2)
Obesity	2 (2)	0	2 (1.3)
Overt-DM	2 (2)	0	2 (1.3)
Asthma	2 (2)	0	2 (1.3)
Chronic hypertension	1 (1)	0	1 (0.7)
Depression	1 (1)	0	1 (0.7)
SLE	1 (1)	0	1 (0.7)
Seizure	1 (1)	0	1 (0.7)
Thalasemia trait	1 (1)	0	1 (0.7)
Varicose vein	1 (1)	0	1 (0.7)
Complications			
GDM	7 (14)	1 (1)	8 (5.3)
Oligo	8 (16)	0 (0)	7 (4.7)
PPH	5 (10)	0 (0)	5 (3.3)
GHTN	4 (8)	1 (1)	5 (3.3)
Prom	4 (8)	1 (1)	5 (3.3)
FGR	3 (6)	0 (0)	3 (2)
Rh- incompatibility	2 (4)	0 (0)	2 (1.3)
Breech	1 (2)	0 (0)	1 (0.7)
Thrombocytopenia	1 (2)	0 (0)	1 (0.7)
Lo-FGR	1 (2)	0 (0)	1 (0.7)
Pre-EC	1 (2)	0 (0)	1 (0.7)
Severe pre-EC	1 (2)	0 (0)	1 (0.7)

The types of risk factors and complications developed among post-Covid mothers with normal mothers are depicted in table 4. The most common risk factors among post-Covid mothers were hypothyroidism (30%) and anaemia (20%). The most common complications were oligohydramnios (16%), GDM (14%) and PPH (10%).

Discussion

The current study found that the post-Covid mothers had high obstetric risk factors and complications as compared to the control mothers. Another study by Villar J et al discovered a similar correlation between pregnant women with a diagnosis of COVID-19 and increased rates of unfavourable outcomes, such as maternal death, preeclampsia, and preterm birth, when compared to pregnant women without a diagnosis of COVID-19 [11]. Hence, it is very evident that COVID infection leads to obstetric risk factors among pregnant women. A scoping review conducted by Kotlar B et al reported that among mothers with a COVID-19 history the labour and delivery outcomes were varied [10]. Another study by Villar J et al found that a consistent association between pregnant individuals with COVID-19 diagnosis and higher rates of adverse outcomes, including maternal mortality, preeclampsia, and preterm birth compared with pregnant individuals without COVID-19 diagnosis.

Our study found that the chances of preterm delivery, LSCS and blood transfusions are high among post-Covid mothers as compared to normal mothers. Jing Y et al reported that by attaching to the angiotensin-converting enzyme (ACE) 2, the COVID-19 virus enters the target cell and modifies the expression of ACE2 in the host cells. The placenta, uterus, vagina, and ovary all have high levels of ACE2 expression. In addition to controlling luteal angiogenesis and degeneration, Ang II, ACE2, and Ang (1-7) also affect the regular changes in endometrial tissue and embryo development. Considering these functions, 2019-nCoV may affect female reproductive processes by controlling ACE2 [6]. These could be the reason for the difference in maternal outcomes between the groups.

In the present study, the most common risk factors among post-Covid mothers were hypothyroidism and anaemia. Duntas LH and Jonklaas J found that the COVID-19 infection is associated with triggering GD and SAT, and possibly hypothyroidism [12]. Bergamaschi G et al reported the prevalence of anaemia was 61% in COVID-19 [13]. The most common complications were Oligohydramnios, GDM and PPH. Studies already reported an altered prevalence of GDM among COVID-19 infected women [14]. Kalsar P et al in one of their case report in 2021 detailed a severe PPH in a woman with COVID-19 infection [15]. Therefore, it is important to know the COVID-19 history among pregnant women to provide them with better care and safety precautions.

To the best of our knowledge, this is one of the first studies from India to compare the risk factors, complications and maternal and neonatal outcomes in mothers with post covid with normal mothers. As the data was retrieved from records, the chances of recall bias do not exist. However, there are a few limitations to the study. Since the complete data of many mothers with post-Covid infections was not available, the generalizability findings are limited. Even though, there are few factors significantly different between the groups, inadequate samples in the subgroups lead to a wide confidence interval for odds ratios. Since our study used data from a single tertiary care hospital, the representation of the general population is not sure.

Conclusion

Obstetric risk factors and complications were significantly high among post-Covid women. Therefore, utmost care should be given to pregnant women with a history of COVID-19 infection. Interventions to reduce the risk factors and complications among these women are much needed.

Conflict of interest: None. **Disclaimer:** Nil.

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